INTUSSUSCEPTION OF MECKEL'S DIVERTICULUM.

REPORT OF A CASE COMPLICATED BY STENOSIS OF THE INTESTINE BELOW LEADING TO SECONDARY INTUSSUSCEPTION OF THE SMALL INTESTINE.

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THE following case is worth recording on account of its extreme rarity:

The patient, G. W., aged nineteen years, billiard-marker, was admitted into King's College Hospital on March 12, 1904. The patient gave a history of indefinite abdominal discomfort lasting for about two years, which culminated in an attack of vomiting and diarrhœa in July, 1903. This attack was followed by others at intervals of about a couple of weeks. The usual history of these attacks was that the abdominal discomfort, flatulence, etc., increased until vomiting occurred. The amount vomited was copious, of a greenish or yellowish character, and its ejection was followed by marked relief. The attacks had of late increased in frequency until they occurred about once a week. His previous history was unimportant, except that when a child he was said to have suffered from "consumptive bowels."

On admission the patient was fairly well nourished, pale, with dry lips, but without any distinct anxious expression. The abdomen moved normally on respiration, was only very slightly distended, and, with the exception of a spot about an inch and a half below the umbilicus in the middle line, there was no tenderness. In the left iliac region there was a tympanitic note on percussion, and a good deal of gurgling could be felt in this region. Nothing could be made out per rectum. The temperature was normal.

On March 16 the patient had his first attack of vomiting in the hospital, about two pints of semiliquid material being brought up. The vomit contained about 65 per cent. of hydrochloric acid, but was not otherwise abnormal. Since admission there had been no rise of temperature, and the bowels had acted twice daily without any aperient.

On March 19 he complained of a good deal of flatulence and abdominal pain. About mid-day the pain became more acute, being referred to the epigastrium, and a distended loop of bowel appeared in the left iliac region. This was tender, but quickly disappeared on being touched. In the afternoon the patient vomited about twenty-eight ounces of fluid and the symptoms were relieved. Later, however, the relief afforded by the vomiting passed off, and the patient was again in great pain. Another loop of bowel could be seen just below and to the right of the umbilicus; this again rapidly disappeared on being handled, and its disappearance was accompanied by a distinct gurgle. The resonance of the left iliac region was impaired and an indefinite lump could be felt there. Later in the evening the patient had another attack of pain more acute than the first; there was again vomiting,—sixteen ounces,—and the bowels were moved, the motion containing mucus but no blood. Indeed, no blood had been passed per rectum at any time.

The next day, March 20, the patient was more comfortable in the morning, but in the evening the pain returned. There was again a distended coil of intestine to be seen, and vomiting also occurred; but on this occasion the pain was not relieved by it. There was still impaired resonance in the left iliac fossa. The pain was distinctly colicky and was very severe. It was relieved by a subcutaneous injection of morphine. The pain continued to come on in spasms during the 21st, and a rounded, soft swelling could be felt just below the umbilicus, which became distinctly harder when the spasm of pain came on. The vomiting persisted.

The following day, March 22, the patient became much more exhausted, but the vomiting had ceased. The pain was just the same as before and of a colicky character, but there was no abdominal rigidity.

March 23. The abdomen was opened in the middle line, the umbilicus being about the centre of the incision. A coil of distended and much congested small intestine presented itself. On further examination a large intussusception was found lying in the pelvis. The mass was brought out of the abdomen, sterilized cloths were packed around, and the intussusception, which was about eighteen inches long, was easily reduced, there being no lymph nor any tendency to adhesion at all. When it was reduced, a second intussusception presented itself, and this again was easily squeezed out, and there were no adhesions between the intussusceptum and the intussuscipiens. A mass was now felt, in which there was again an intussusception to be noticed, which could not be reduced, and the whole mass was so inextricably involved that it seemed best simply to excise it. The intestine was therefore cut across above and below, both ends were stitched up, and a lateral anastomosis was made. The upper portion of the bowel was so enormously dilated as compared with the lower that an end-to-end union did not seem likely to be satisfactory. The piece of bowel involved was the small intestine. Its exact position above the ileocæcal valve was not ascertained, but I should think it was from two to three feet above.

The patient was severely collapsed after the operation, and there was a considerable amount of colicky pain and rather troublesome nausea. However, the patient very soon improved, and on March 26 the note is that "The patient's condition is much improved; he has begun to take small feeds by the mouth in addition to rectal feeding, and has lost his pain." From this time onward the patient progressed without any bad symptom. The wound healed by first intention, and by the time he left the hospital, on May 11, he had completely recovered, felt well, and was rapidly gaining in weight, having made nine pounds in the last fortnight.

Description of the Portion resected.—The lower part (*E*) (Fig. 1) consisted of small intestine, which had apparently formed the apex of the second intussusception. It had evidently been constricted; its mucous membrane was smooth and covered with villi; but there were no traces of any valvulæ conniventes, and there were only slight rugæ towards the upper end. About an inch of this portion of the intestine had been cut off.

At the upper end, the lumen of the bowel rapidly narrowed till there was only a narrow channel (*C*) connecting this portion (*E*) of the intestine and the distended upper portion (*A*). This channel was lying at the border of the mesentery. It was about two and one-half inches long; it was about the caliber of a goose-quill; the wall of it was thickened and composed of scar tissue, and it was for the most part apparently devoid of mucous membrane. This narrow canal joined the intestine above (*A*), which

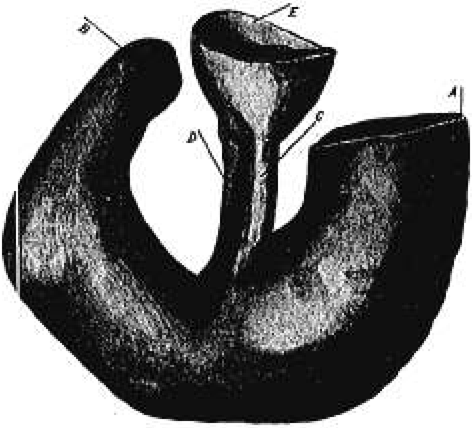

FIG. 1.—*A*, Upper part of bowel; *B*, diverticulum pulled out; *C*, narrow tube connecting the upper and lower parts of the bowel; *D*, mesentery; *E*, lower part of bowel.

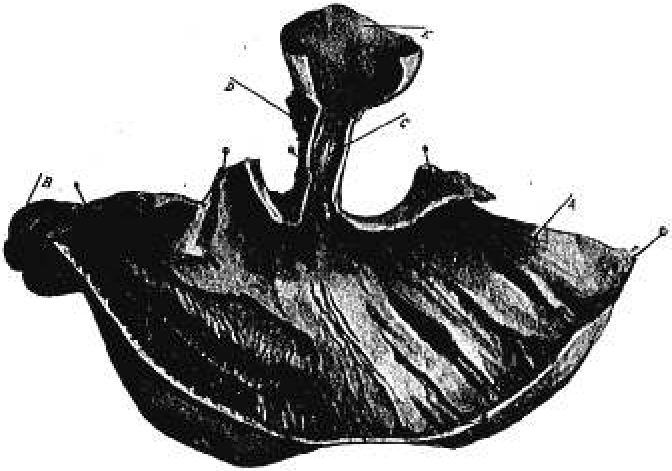

Fig. 2.—*A*, Upper part of bowel; *B*, diverticulum inverted; *C*, narrow canal connecting the upper and lower parts of the bowel; *D*, mesentery; *E*, lower part of bowel.

was enormously dilated. From the point of junction, the intestine on the one side ran upward and was continuous with the intestine above, which was enormously dilated; on the other side of the attachment of this canal there was an abnormal diverticulum which was invaginated. The diverticulum when pulled out was four inches long. It was conical in shape with smooth peritoneal walls. Its inner surface showed a ridge which corresponded to the mesenteric attachment. (Fig. 2.) This diverticulum (*B*) was filled up by a pyriform structure consisting of the intussuscepted swollen terminal portion, the end of which hung into the distended upper portion of the intestine. This projection consisted mainly of mucous membrane and submucous tissue, but at the outer part the serous membrane was also invaginated for about an inch: a probe could be passed into the pedicle of the diverticulum from the peritoneal cavity. The mucous membrane covering it was normal and covered with villi and valvulæ conniventes. The whole of the structures described, namely, the distal portion of the bowel just below the constricted part, the constricted portion itself, and the diverticulum, had been invaginated into the portion of bowel below, the apex of the intussusceptum being formed by the bowel just below the stricture.

The case is clearly one of an intussuscepted Meckel's diverticulum, and, like several of the cases of this condition which have been published, it is essentially the mucous membrane which is invaginated. The case, however, differs from those published, with one exception (Ewald's No. 13), in that there is a narrow strictured canal connecting the upper and lower portion of the intestine. As to the origin of this canal, I should think that it is most probably a congenital stricture of the small intestine. Congenital strictures of the small intestine have been described as occurring along with and at the point of attachment of a Meckel's diverticulum, and probably this strictured portion had become narrower of late on account of sloughing of the mucous membrane. Against this view may be urged the fact that the patient for seventeen years had given no indication of having anything wrong with his intestine, but it is quite possible that the stricture had become tighter of late; in fact, this is highly probable, seeing that some inflammatory process had been going on leading to disappearance of the mucous membrane and thickening of the walls, and thus the stricture may have become so much narrower as to interfere with the proper passage of the intestinal contents. It is probable, also, that the occurrence of the intussusception of the Meckel's diverticulum had increased the trouble, the end of the intussuscepted portion lying like a valve over the orifice of this narrow canal. I should think that the train of events probably was that the patient had a Meckel's diverticulum, and had a fairly narrow congenital stricture of the intestine; that the discomfort to which the latter gave rise was comparatively slight, and the patient had become so accustomed to it that he did not notice anything abnormal; that inflammation of the mucous membrane of this strictured portion occurred, leading to swelling and increased obstruction; and that, as the result of the efforts of the intestine to overcome the obstruction, the Meckel diverticulum itself had become invaginated; that, once this had taken place, the end of the invaginated portion lay like a valve over the opening of the congenital stricture, and thus increased the obstructive troubles; and then, as the result of the violent and constant peristaltic action, the affected portion of the intestine, namely, the diverticulum and the stricture, had become invaginated into the intestine below. The invagination had not been so tight as to interfere with circulation; hence there were no adhesions between intussusceptum and intussuscipiens. The curious condition of the original intussusception having become again invaginated into the bowel below was probably of recent occurrence.

On searching the literature, I find reference to sixteen cases of intussusception of a Meckel's diverticulum; but in only one of them (Ewald's) do I find mention of a stricture as well. Seven of these cases were collected some years ago by Küttner (see *Beiträge zur klinischen Chirurgie*, Vol. xxi, 1898), and Halstead, in the ANNALS OF SURGERY, Vol. xxxv, 1902, in a paper on troubles connected with Meckel's diverticulum, gives a list of cases in which I find several in which invagination of the diverticulum had occurred. In his paper he states that twelve cases in all had been reported. Other isolated cases have also been published, making with this case of mine seventeen in all.

Two views have been expressed as to the mode in which invagination of the diverticulum takes place. Küttner looks on its occurrence as due to active peristaltic action on the part of the diverticulum itself: in one of his cases this was set up by a polypus, in another by the presence of an accessory pancreas. In other cases where the etiology is not clear, Küttner thinks that the diverticulum becomes filled with fæcal matter, and in the peristaltic efforts to dislodge it invagination takes place, and once this has occurred the peristalsis is increased and the invagination rapidly progresses. De Quervain thinks that the invagination occurs in a passive manner, namely, that the rapid flow of the intestinal contents past the orifice of the diverticulum produces a negative pressure in the diverticulum, and thus draws it into the intestine. I must say that I can hardly think that the latter view is a likely one.

In most of the cases it is noted that it is chiefly the mucous lining of the diverticulum which has become invaginated, probably due to the loose attachment of the mucous membrane. Of course, once the diverticulum has become more or less inverted into the bowel, the subsequent occurrence of intussusception of the intestine is quite a natural result. It may, however, be noted that in a number of cases only the diverticulum has been found invaginated without any intussusception of the intestine. Hohlbeck found that in twelve published cases there was intussusception of the diverticulum alone in five, and in seven, intussusception of the intestine as well (four times iliac, once ileocolic, and twice ileocæcal).

The following is a list of all the cases published, including those collected by Küttner and Halstead:

1. HOHLBECK. (*Archiv für klinische Chirurgie,* Vol. lxi, 1900.)—Female, aged nineteen years. Severe pain in the abdomen and obstructive symptoms three days before admission. Sausage-shaped tumor felt in the ileocæcal region. Abdomen opened on the outer side of the right

rectus. Ileocæcal invagination found; reduced, and then an abnormal Meckel's diverticulum found, which was removed. Patient died two days later. On examination the mucous membrane lining the diverticulum was separated from the muscular coat and invaginated, forming a floating tumor in the lumen of the intestine.

2. WAINWRIGHT. (ANNALS OF SURGERY, Vol. xxxv, 1902.)—Male, aged seventeen years. Six days before admission, failure of appetite, sense of fulness, constipation. Worked for five days. Then severe pain in epigastrium and complete obstruction and vomiting. No tumor. High oil enema given, but returned with blood only. Abdominal section. Eight ounces of clear serum in the peritoneum. Sigmoid and cæcum empty. Intussusception three inches long, about three feet from the ileocæcal valve. Invagination easily reduced; no adhesions. It was then found that there was a diverticulum which was itself inverted, the inverted apex of it evidently forming the apex of the intussusception. Easily reduced; the diverticulum clamped and cut away. Recovery uneventful.

3. DE QUERVAIN. (*Centralblatt für Chirurgie,* 1898.)—Male, aged sixteen years. Seized suddenly with violent abdominal pain and vomiting. Repeated action of the bowels. No diagnosis made. Laparotomy. Foul-smelling bloody fluid found and an intussuscepted piece of small intestine. Gangrene had occurred at the neck of the intussusceptum. Resection of the intussuscepted portion, which was ten centimetres long, and an artificial anus formed. Death in a few hours. On opening the invagination, a polypoid structure about five centimetres long was found somewhat swollen at its end. This was an inverted diverticulum.

4. STUDSGAARD. (*Centralblatt für Chirurgie,* 1894, quoted from De Quervain.)—Male, aged thirty-seven years; admitted with peritonitis and intussusception of the ileum; laparotomy; resection; death. The intussusception was found to be caused by an invaginated diverticulum.

5. BRUNNER. (*Beiträge zur klinischen Chirurgie,* Vol. xxv, 1899.)—Patient aged four years. Seized suddenly with abdominal pain three days before admission. Passed blood afterwards. No proper action of the bowels. Diagnosis of intussusception. Laparotomy. Ileocæcal intussusception found. Irreducible. The portion resected. Patient did well. Resected portion measured twenty-two centimetres. On looking into the cæcum, a bell-like, firm tumor was seen to be hanging into it; it was somewhat pear-shaped and bent towards the mesenteric side; it had a pedicle attached to the small intestine. The surface of the tumor covered with mucous membrane. On further examination an accessory pancreas was found on the serous side of this projection covered with a fold of fat. This had apparently led to the invagination. The case was therefore an accessory pancreas at the blind end of a true diverticulum of the intestine. As the result, invagination of the diverticulum, and subsequently invagination of the ileum through the ileocæcal valve.

6. VON STUBENRAUCH. (*Centralblatt für Chirurgie,* July 2, 1898.)—Girl, aged five and a half years. Acute seizure, bloody stools, colic, diarrhœa, etc., five days before admission. Sausage-shaped tumor. Laparotomy performed. Intussusception ten centimetres above the ileocæcal

valve. Intussusceptum gangrenous. Death two hours later. In addition to the intussusception of the small intestine, there was an inverted Meckel's diverticulum.

The following four cases are taken from Halstead's paper (ANNALS OF SURGERY, Vol. xxxv, 1902):

7. ROBINSON. (*British Medical Journal,* 1899, Vol. ii.)—Male, aged five years. Acute pain referred to umbilicus; abdominal distention; tumor on the right side of abdomen. Diagnosis, intussusception. Resection; death two hours later. Invagination of diverticulum and intussusception of the small intestine as well.

8. ADAMS. (*St. Bartholomew's Hospital Reports,* 1891.)—Male, aged forty-two years. Symptoms obscure, rather chronic. Evidence of obstruction lasting two weeks. No operation. Death. Invagination of diverticulum and ileocolic intussusception.

9. ADAMS. (*St. Bartholomew's Hospital Reports,* 1891.)—Male. No clinical history. At autopsy, intussusception of diverticulum.

10. WEILL ET FRAENKEL. (*Bull. de la Soc. de Anat. de Paris,* 1896.)—Female, aged four years. Acute ileus, one day's duration. Invagination of diverticulum and ileum. Resection of intestine; suture. Death.

The remaining cases are from Küttner's paper in the *Beiträge zur klinischen Chirurgie,* Vol. xxi, 1898:

11. KÜTTNER. (*Beiträge zur klinischen Chirurgie,* Vol. xxi, 1898.)—Female, aged forty-nine years. Symptoms of acute obstruction for three days. (Similar attack eight weeks previously, which passed off suddenly after five days.) Great distention. Laparotomy. Pus in the pelvis. State of matters not made out. Pus sponged out. Anastomosis between dilated intestine above and collapsed intestine below. Death. On examination, polypus-like structure found in the intestine about seven centimetres long, which proved to be a Meckel's diverticulum invaginated and projecting into the small intestine. It was situated about ninety centimetres below the commencement of the jejunum. In the middle there was gangrene of all the layers of the small intestine and three minute perforations.

12. MARONI.—Man, aged twenty-six years. Intestinal obstruction. Abdomen opened. Found torsion of small intestine, which was rectified; but patient died. Post-mortem: a second complete obstruction in the lower part of the ileum due to a Meckel's diverticulum inverted into the lumen of the bowel. The invagination was caused by a polypus in the diverticulum.

13. EWALD.—Female, aged forty-two years. Has had several attacks of violent pain in the abdomen, constipation, and vomiting, from which she recovered. She died in the last of these attacks. It was found that there was a Meckel's diverticulum which had become invaginated into the

intestinal canal. In addition there was a stenosis of the intestine scarcely admitting a lead-pencil. In the centre of the inflamed part was a small perforation which had led to suppurative peritonitis.

14. **Heller**, in a pathological specimen, found a true intussusception of a Meckel's diverticulum.

15. **Heller.**—Post-mortem result in a patient aged fifty-six years who had died of perforating ulcer of the stomach. Movable cord found in the lumen of the intestine with a marked swelling at the end. A hollow on the outside about one centimetre from the mesenteric attachment, cause of invagination of the diverticulum. At the apex of the diverticulum was an accessory pancreas.

16. **Heller.**—Post-mortem in a patient who died of pyonephritis; 180 centimetres above the ileocæcal valve a worm-like body, about ten centimetres long, projecting into the small intestine, covered with mucous membrane. This was an invagination of a diverticulum of the small intestine.